DOCUMENT RESUME

ED 384 421 PS 023 362

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TITLE Improving Problem-Solving Abilities of Third-Grade Students through the Use of Problem-Solving Strategies.
PUB DATE 94
NOTE 35p.; Ed.D. Practicum Report, Nova Southeastern University.
PUB TYPE Reports - Research/Technical (143) -- Dissertations/Theses - Practicum Papers (043)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Classroom Techniques; *Elementary School Mathematics; Elementary School Students; Grade 3; Learning Activities; Learning Strategies; Mathematical Concepts; Mathematics Achievement; Mathematics Education; *Mathematics Instruction; Primary Education; *Problem Solving; *Student Attitudes; Teaching Methods; *Word Problems (Mathematics)
IDENTIFIERS *Knowledge Acquisition; Mathematics Activities

ABSTRACT

This practicum was designed to improve third grade students' problem-solving abilities through the use of problem-solving strategies. The project was implemented in a suburban elementary school that has a high percentage of students with limited or no English language skills. Activities were designed to increase the students' interest in solving word problems and to improve their problem-solving skills. Divided into small, cooperative groups, the students were taught how to use open-ended questions and problem-solving strategies such as patterns, charts, and graphs. Emphasis was placed on mathematical language development, reading word problems with understanding, and writing. The students wrote, read, and solved original word problems. Parents participated as math-partners. Observation data on how the students responded to various activities were collected and recorded in a log for evaluation. The students' work was evaluated regularly during and at the end of the project. Samples of the students' work were kept in a portfolio so that progress could be monitored by the teacher and the students. The results of the practicum indicated that when students are taught problem-solving strategies and how to read word problems with understanding, the students will be successful in solving word problems and will enjoy solving the problems. The questionnaire used for preliminary student interviews is included. Contains 16 references. (AA)

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Improving Problem-Solving Abilities of Third-Grade Students Through the Use of Problem-Solving Strategies

ED 384 421

by

Letta Grace Wilborn

Cluster 39

A Practicum II Report Presented to the
Ed.D. Program in Early and Middle Childhood
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

NOVA SOUTHEASTERN UNIVERSITY

1994

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PRACTICUM APPROVAL SHEET

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Approved:

28 June 1994
Date of Final Approval of Report

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ACKNOWLEDGMENT

The writer wishes to acknowledge the following persons:

Dr. Stan Olivier, Cluster 39 Coordinator

Dr. Roberta Wong Bouverat, Practicum Adviser

Mrs. Helen Benavides, Site Principal

Miss Margie Solano, Classroom Aide

The writer also wishes to thank the members of her family for being patient and understanding.

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ABSTRACT

Improving Problem-Solving Abilities of Third-Grade Students Through the Use of Problem-Solving Strategies.
Wilborn, Letta G., 1994: Practicum II Report, Nova Southeastern University, Ed.D. Program in Early and Middle Childhood.
Descriptors: Elementary School Mathematics/Problem Solving/ Problem-Solving Strategies/Writing Story Problems/Word Problems.

The practicum was designed to improve third-grade students problem-solving abilities through the use of problem-solving strategies.

Activities were designed to increase the students' interest in solving word problems and improve problem-solving skills. The students were divided into cooperative groups. They were taught how to use open-ended questions and problem-solving strategies such as patterns, charts, and graphs. Emphasis was placed on mathematical language development, reading word problems with understanding, and writing. The students wrote, read, and solved original word problems. Parents participated as math-partners. Observation data on how the students responded to various activities were collected and kept in the writer's log for evaluation. The students work was evaluated regularly during the implementation and at the end of the implementation. Samples of the students work were kept in a portfolio so that progress could be monitored by the teacher and the students.

All of the objectives were successfully met. The results of the practicum indicated that when students are taught problem-solving strategies and how to read the word problems with understanding, the students will be successful in solving word problems and will enjoy solving the problems.

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Letta G. Wilborn (signature)

CHAPTER I

INTRODUCTION

Description of Work Setting and Community

This practicum took place in the western United States in a suburban school district whose attendance boundaries service communities within several different cities. Within the last 20 years, the school district has experienced major changes in the school communities served within its boundaries. The Hispanic enrollment has doubled. Within the same 20 year period, the Caucasian population has decreased from 72% to 20%. The district enrollment is 49% Hispanic, 20% Caucasian, 14% Asian, 9% Filipino, 8% African-American, 0.2% Indian, and 0.5% Pacific Islander. The communities range from the affluent to the very poor.

The district student population is transient in some schools with a turnover at the classroom level of over 40%. In other schools the population is very stable. The school district is very concerned about the student movement and tracks the various changes in the student population movement. The movement falls into two categories: those who entered school after the first day, and those who left school before the last day. The district is also concerned about absences. There is a continuing effort to improve attendance.

A high percentage of the students are limited English-speaking or non-English-speaking. The district

Educational programs are designed to meet the needs of English-speaking and non-English-speaking students.

Writer's Work Setting and Role

The primary work setting for the writer is a third-grade classroom in an elementary school in the district. The school is located in a low socio-economic Mexican-American neighborhood. Unemployment is high. In some instances two and three families live in the same small house.

The school enrollment is 903. The school enrollment is 87.3% Hispanic, 5.9% Caucasian, 2.1% Filipino, 1.9% Asian, 0.3% African-American, 0.4% Pacific Islander, and 0.1% American Indian. The 903 children are divided among 30 classrooms. The grade levels taught are kindergarten through sixth grade. There are bilingual classrooms as well as English-speaking classrooms. The writer's classroom is an English-speaking classroom with 32 children in it. The writer is assisted by 2 aides. One aide works 1 hour each day. The other aide works 2½ hours per week. There are 13 girls and 19 boys in the class. There are 29 Mexican-Americans, 2 African-Americans, and 1 Asian-American in the classroom.

CHAPTER II

STUDY OF THE PROBLEM

Problem Description

The problem was that third-grade students needed to improve in their ability to solve math word problems.

Problem Documentation

Evidence of the problem was supported by information gathered from student interviews, test results, and students' work.

A series of student interviews held during the week of September 14-19, 1992, revealed that only 7 of the 32 students liked word problems and found them easy to read. (See Appendix A for a list of questions asked during the interviews.)

A review of the mathematics portion of the spring 1992 Individual Tests of Academic Skills (ITAS) showed that only 8 of the 32 students in the writer's class scored above the 50th percentile on the problem-solving section of the test. Out of a group of 8 word problems on a test administered by the writer, only 14 of the students solved any of the problems.

The students in the practicum are not the same students who were in the proposal, but they are representative of all third-grade students in the school.

Causative Analysis

The writer believed that there were three reasons for the

problem. One, more emphasis had been placed on computational skills than on understanding concepts and strategies. Two, the students did not know what to do even when they could read the words. Three, the students did not have self-confidence in their ability to solve word problems. The children thought that they could not do it, therefore, they did not. When given a group of 8 word problems that the students could read, only 2 students solved all 8 problems. When read the same group of 8 word problems, and told which operation to use, 28 of the 32 students were able to solve at least 5 of the problems.

Relationship of the Problem to the Literature

A review of the literature gave evidence of a lack of student success with problem-solving skills, and a lack of those skills being taught. Bruni (1982) stated that children enter first grade eager to solve mathematics problems, but are turned off by the time they reach third grade. He also stated that primary-grade teachers need to help nurture problem-solving skills because it is important that primary children remain convinced that they are good problem-solvers. Burns (1985) and Campbell (1984) indicated that traditionally the goal of arithmetic has been to teach computational skills instead of problem-solving skills. Huniker (1989) stated that students find it difficult to solve word problems because they are unsure of how to think about deciding what operation to use.

The literature suggested four major causes of the problem. Several authors discussed the students' inability to understand the problem as a cause. Knifong and Burton (1985) reported that even though students could read the words in a problem they did not understand what they read. Kantowski (1981) noted that one of the most neglected aspects of problem-solving is that of understanding the problem. Van Haneghan (1990) found that students made errors because the students did not understand what key words meant.

CHAPTER III

ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS

Goals

The following goal and outcomes were projected for the practicum.

The goal of the writer is to nurture and motivate the students to the extent that they will be able to use strategies to solve word problems.

Expected Outcomes

Objective 1: After implementation all 32 of the students will enjoy solving word problems.

Objective 2: By the end of the implementation period all 32 of the students will be able to read word problems, think about the problems, and analyze the steps necessary to solve the problems.

Objective 3: By the end of the implementation period all 32 of the students will be able to write and read original story problems.

Objective 4: By the end of the implementation period all 32 of the students will be able to read, understand, and solve one-step (problems that require only one operation such as addition, subtraction, multiplication or division) word problems.

Objective 5: By the end of the implementation period, 25 of the 32 students will be able to solve multi-step problems.

Measurement of Outcomes

Objective 1 was measured by the writer's observation of whether or not the students chose solving word problems as a free time activity and by talking with the students about the word problems. Observation was used as a method of evaluation because it gave the writer the opportunity to determine how many students spent time solving word problems each day. Observation allowed the writer to spot errors immediately and to involve the students in dialogue about the writer's observations. The writer was also able to determine how often the students chose solving word problems for a free time activity. Talking with the students was chosen as a means of assessment because it gave the students an opportunity to express feelings about the activity and to ask questions if necessary.

Objective 2 was measured by the information taken from the writer's log. This method was used so that the writer could visually verify that the students had done the work. The writer could tell which strategy was helping the students by how successful the students were with the activities involved with the strategy.

Objective 3 was measured by the number of students who wrote stories and turned the stories in to the writer to be evaluated. This method was used because it gave the students the responsibility of seeing that the work was completed and given to the writer. The students' ability to read was

measured by the number of students who were able to read the stories to the class. This method was used because it gave the students an opportunity to practice oral communication skills. Having the opportunity to read orally gave the students a reason to practice reading.

Objective 4 was measured by the quality of the work turned in by the students. This method was used because it gave the students the responsibility of checking work before turning it in to the writer. The work was kept in portfolios so that the writer and the students could check the students' progress on a continuous basis.

Objective 5 was measured by the quality of work done in class and by the results of a test with 8 word problems on it. The problems were selected by the writer. The work done in class was used as a means of evaluation because it showed the student's progress over a period of time. By evaluating the papers when turned in, the writer was able to give the students immediate feedback. The results of the test were used because using the test results allowed the writer the opportunity to give the students immediate feedback. The test included multi-step problems. From the results of the test the writer was able to determine if the students really understood the process and could use the strategies to help solve word problems successfully when working completely alone.

CHAPTER IV

SOLUTION STRATEGY

Discussion and Evaluation of Solution

The problem is that third-grade students need to improve in their ability to solve math word problems.

The ability to solve word problems is a key element to mathematics education. Learning to solve word problems in elementary school prepares students to use mathematics in the real world. One of the biggest problems facing elementary school teachers today, especially at the third-grade level, is that of successfully teaching students to solve word problems.

To help children understand and solve word problems Charles (1985) and Wilde (1991) suggested using process problems to complement the one-step and multi-step problems that are generally included in elementary school mathematics programs. Process problems are those problems that cannot be solved simply by choosing one or more strategies, such as drawing a picture, guessing and checking, making a table, or looking for a simpler problem.

Fennell and Ammon (1985) suggested having children write original word problems. Writing word problems combines reading, critical thinking, and the collection and organization of data. When students write original word problems, the

students gain insight into the relationship between verbal expression and equations. The students also learn to translate personal experiences into mathematical terms. Writing also allows math to be integrated across the curriculum. Kennedy (1985) suggested having students write letters as an integral part of the curriculum. Writing letters allows the students to clarify thinking or ask questions. Students can also use a simple form of open-ended writing as a follow-up to a lesson as suggested by Wilde (1991).

O'Connell (1992) suggested that parents be math partners with their children. By having parents serve as partners, the cooperative group idea can be extended to the home. The parents can discuss problem-solving activities with the children at home.

Slavin, Leavey, and Madden (1984), and Behounek, Rosenbaum, Brown, and Burcalow (1988) suggested that children work in cooperative groups. Cooperative groups can foster a nonthreatening environment in which students can take academic risks. Cooperative groups also provide immediate feedback for what has just been taught by the teacher because the children can ask each other questions and supply the answers. Different types and sizes of cooperative groups can be used.

One of the biggest problems that students have in trying to solve word problems is understanding what to do. Campbell (1984) suggested that the students act out word problems or watch other students act out the problems as the problems

are being read.

Another factor in the students' inability to solve word problems is that of motivation. Students have a tendency to be "turned off" by word problems. Van de Walle and Holbrook (1987) suggested that one way of getting students motivated is by the use of patterning. Patterning is a process of deciding what comes next in a given sequence. Patterning can be done by using the children as props, manipulatives, or paper and pencils. Using patterns also helps students develop self-confidence.

To help the students focus on concepts and solution strategies rather than computation, Wilson (1991) suggested using calculators to help the children solve real problems.

Other ideas to be explored that were generated by the writer are:

1. Encourage parents to become partners with their children to work on problem-solving at home.
2. Have the children keep math journals to write about math. The journals can be used to keep a copy of all the math writing that the students do. The students can write original stories, open-ended questions to ask each other, and letters to the teacher about the lessons. The journals can be used by the students to monitor understanding of concepts.
3. Integrate problem-solving activities throughout the curriculum.

4. Provide awards and incentives for the different ways children solve word problems.

Description of Selected Solution

In order to meet the goal and objectives of this practicum, the writer used the successful teaching strategies suggested by the literature and other ideas generated by the writer.

The writer arranged the children in cooperative groups as suggested by Slavin, Leavey, and Madden (1984), and Behounek, Rosenbaum, Brown, and Burcalow (1988). The initial groups were in groups of twos. For special activities larger groups were formed. The entire class served as one group when the writer was modeling a new concept. Using cooperative groups enabled the students to share knowledge and information.

The writer used calculators in some sessions, as suggested by Wilson (1991), so that the students could focus on the problem-solving process rather than on computation. Since the calculators were not used in all sessions, the use of calculators served as a motivating factor for the students.

Many opportunities for writing about math were provided. The students wrote about math in science, social studies, and language arts.

The writer taught the students how to keep journals. The students wrote original word problems as suggested by Fennell and Ammon (1985).

Report of Action Taken

The writer implemented the plan with 26 students. During the first week of the implementation period the writer arranged the students in cooperative groups. The writer began with groups of 2. This arrangement allowed students to have a partner to work with at all times, not just at math time. The small groups provided the students with the opportunity to learn how to work with and help each other. At the end of the first week the students were arranged into 5 groups of 4 and 1 group of 6. This arrangement allowed the partners to remain together. Each group had a leader and a recorder. There was at least one capable reader in each group. The entire class worked as one group when the writer was modeling new concepts. To help control disruptive social interaction and to keep the groups focused on the math lessons, the students were rewarded with stickers, pencils, posters, books, bookmarks, food certificates from the local fast food restaurant, and other surprises for good behavior and staying on task.

The cooperative groups worked with number tiles as a beginning class activity for 48 days. The writer led the students through the number tile activity in the beginning. After the children understood the number tile activity process, the writer let the children do the activities alone. The writer circulated among the groups and gave assistance when needed.

The activities planned by the writer were designed to

overlap each other. The writer provided activities designed to help the students develop mathematical language. Concepts were developed which established a need for precise language. The writer taught the students how to read and understand the words in relation to math. The writer provided opportunities for the students to use words and terms such as more than, less than, as much as, most, least, equal to, as many as, altogether, add, subtract, difference, fewer than, greater than, twice as much as, and sum. Other words were added to the list as the students progressed through the activities. The writer demonstrated the use of the words and terms first. The writer used the students to perform in many of the demonstrations. For example, during one session, the writer asked all the girls who were wearing dresses to come to the front of the room. The writer then asked the girls who were wearing pants to come to the front of the room. The writer had the other students count together the number of girls wearing dresses and then count the number of girls wearing pants. The writer wrote on the chalkboard, "There are 7 girls wearing dresses and there are 4 girls wearing pants." The writer asked several questions about the sentence, such as:

1. How many more girls are wearing dresses than there are wearing pants?
2. What is the difference between 7 and 4?
3. How many girls are there altogether?

4. What did you do to find out how many more girls were wearing pants?
5. What did you do to find out how many girls there were altogether?

After the initial demonstration the writer had the students take turns making oral problems using the words. The writer acted as recorder and wrote the students' stories on tagboard. The stories were posted around the room so that the students could read the stories again.

The writer introduced the tools (strategies) by modeling each strategy. The strategies were presented visually by using the overhead projector. The writer used unifix cubes, pattern blocks, and cuisenaire rods. The students were given the same materials at their desks so that they could follow along with the writer. After the overview the writer posted a chart of the strategies so that the students could refer to the chart in the following weeks as each strategy was presented in depth. Whenever appropriate the writer asked the students to participate in the demonstrations before using manipulatives to model the strategies.

Two weeks were devoted to part-whole relationships. The writer showed the students how to make models with manipulatives to help the students understand the part-whole relationship of numbers. The writer told the students that there were many ways to solve one problem. The students were given rewards for finding different ways to solve

problems.

The writer taught the strategy of asking open-ended questions as a whole group activity. The writer prepared an assortment of items to be used as visuals during the lessons. For example, the writer had a box of wooden beads that were different sizes, shapes, and colors. The writer also had 4 empty boxes. The students were asked to sort the beads. There were several ways the beads could be sorted. There were no wrong answers. The students were asked to give a reason for the solution selected. The writer had the students make "What is.....?" number booklets. The students cut pictures from magazines that the writer provided and pasted them in their booklets. Some of the students drew pictures. The students also had to write the answer in story format. The writer gave the students the opportunity to make booklets about some of the other items that the writer collected and put on display. The writer circulated to give assistance when it was needed. The writer taught the students how to ask each other open-ended questions when working with word problems in small groups. The writer posted charts that explained how to write open-ended math questions. The children were able to refer to the charts when help was needed with the process.

The writer taught the students how to look for patterns. The children found patterns in everything! All of the students were able to continue a pattern that had been started

by the writer, repeat a pattern, and make original patterns. During the course of the practicum the writer taught the students how to take individual 99 number charts and make patterns for all 12 multiplication tables. The writer had the students write about the patterns in the math journals.

The writer taught the cooperative groups how to write math stories using the classroom environment and the school campus as subjects. The writer and the writer's aide helped the students in each group type 2 stories on the computer. Some of the stories were made into booklets. The writer used the stories for group activities. The writer gave each student a booklet to take home. The writer taught the students how to keep a math journal. Composition books were used for the journals. The students kept various kinds of math writing in the journals.

The use of graphs in the problem-solving process was emphasized. The writer made graphs of the students' birthdays, favorite foods, and favorite books. The graph activities were done with the entire class. After filling in the graphs, the writer asked the students questions about the information on the graphs. The writer had the students write math stories using the information on the graphs.

The writer taught the students how to make and use charts and tables in the problem-solving process. The writer integrated math with language arts and taught the children how to write individual story problems using the information from

the class charts and graphs. The writer had the students prewrite, write, rewrite, and publish the stories. The students were not able to type all of the stories on the computer because the computer was not operational part of the time. Not being able to type the stories did not affect the students interest in writing the problems.

The writer gave instructions to the parents on how to be math partners with their children. The math program was explained to the parents. The parents were given instructions on how to use each strategy. The writer explained to the parents how to encourage the children and how to help the children in the process of discovering answers.

The writer and the students worked with role playing. The writer wrote sentences using some of the words that the students had been studying. The writer had the class read the sentences. The writer then chose various students to perform the action that the sentences suggested. The class had to guess which sentence was being portrayed. The writer then provided the cooperative groups with a math story problem to discuss and perform.

The writer introduced multi-step addition and subtraction problems as a whole class activity. After working with some problems that the writer presented, the writer had the class brainstorm and make up some problems. The writer wrote the problems on the board. The writer had the students use calculators to do the computations.

The writer introduced the multiplication process by having the students write the meaning of multiplication. The students were allowed to draw pictures or use any of the other strategies that had been discussed while writing the answer. The writer had the cooperative groups make lists of things that came in 2s, 3s, 4s, 5s, and 6s. The writer made a master chart of the lists. The writer taught the students how to use the strategies to solve multiplication and division word problems.

The writer transformed part of the classroom into a convenience store. The students were given play money to make purchases. The writer taught the students how to write a script using some of the terms that had been taught. The writer videotaped the students making purchases in the store while saying some of the lines the students had written. The writer played the tape for the students.

The writer checked the journals when the students turned the journals in periodically and at the end of the implementation. The writer complied the information from the writer's log. The writer checked the students' portfolios regularly during the implementation and at the end of the implementation. The writer administered a post test of 8 word problems selected by the writer.

CHAPTER V

RESULTS, DISCUSSION, AND RECOMMENDATIONS

Results

The problem was that third-grade students needed to improve in their ability to solve math word problems.

The writer interviewed 32 third-grade students in the fall of 1992. Of the 32 students interviewed, only 7 liked word problems and found word problems easy to solve.

A review of the mathematics portion of the spring 1992 Individual Tests of Academic Skills (ITAS) showed that only 8 of the 32 students in the writer's class scored above the 50th percentile on the problem-solving section of the test. Out of a group of 8 word problems administered by the writer, only 4 of the students solved any of them. A further analysis of the problem revealed that it was a common problem with all third-grade students in the school.

The writer's strategy was to nurture and motivate the students to the extent that the students would be able to use strategies to solve word problems.

The results of this practicum clearly indicate the following: (1) When students are taught problem-solving strategies and when given the opportunity to solve word problems, the students will like and enjoy solving word problems. (2) When taught how to read word problems with understanding and how to use strategies to help solve the

problems, the students will be successful in solving word problems and will enjoy solving the problems. (3) Writing and reading original word problems make a difference in the attitude of students toward solving word problems and the amount of effort the students will use to try to solve the problems. (4) Providing real life experiences such as field trips, and shopping sprees for students will increase the students interest in writing and in solving word problems. (5) Working in cooperative groups helps students build self-confidence in ability to solve word problems. (6) When given a reason for solving word problems, students will work hard to find a solution.

Objective 1 was that all 26 of the students would enjoy word problems. The objective was met. After the initial lessons about how to solve word problems and which strategies to use, the writer observed that at math workshop time all of the students chose word problems. Students were having minor difficulities solving them. After a few sessions there were no difficulties observed. When asked if solving word problems was an enjoyable activity, the students' response was "Yes."

Objective 2 was that all 26 of the students would be able to read word problems, think about the problems, and analyze the steps necessary to solve the problems. The objective was met by all 26 students.

One problem solving strategy that helped unlock the mystery of solving word problems for the students was to have

the students write original story problems. This was consistent with the findings of Fennell and Ammon (1985). The students found it very easy to explain the steps in stories that the students had written. As the students progressed through the program, the students found that it was just as easy to analyze someone else's problem.

Objective 3 was that all 26 of the students would be able to write and read original story problems. The objective was met. The students became so fascinated with writing math stories to the extent that math stories were written in reading, social studies, and science. The students even wrote word problems at home and brought them to school to share. The students reading ability improved because the students had to practice reading the problems in cooperative groups before reading the stories to the class. This was consistent with the findings of Fennell and Ammon (1985).

Objective 4 was that all 26 of the students would be able to read, understand, and solve one-step (problems that require only one operation such as addition, subtraction, division or multiplication) word problems. The objective was met. All 26 of the students were able to read, understand, and solve one-step word problems.

A key part of the practicum was teaching the students how to read and read with understanding. Emphasis was placed on mathematical terms which were crucial to understanding how to read the problem and knowing which operation to select. The language development process continued throughout the

implementation.

Objective 5 was that 21 of the 26 students would be able to solve multi-step problems, (problems that require more than one operation) as measured by the work turned in and by the results of a test consisting of 8 word problems selected by the writer. Objective 5 was met. Twenty-three of the 26 students were able to solve all 8 of the multi-step problems on the test. An analysis of the work turned in showed that the students made consistent growth as each new strategy was studied in depth. As the implementation period progressed more students turned in work without having to be asked.

Discussion

The students' progress observed during the implementation of the practicum has strongly impacted the writer's perception of teaching and learning. The results of the practicum show that when students are taught problem-solving strategies, the students ability to solve word problems will improve. The results also show that students interest in solving word problems increases with the students understanding of the problem-solving process.

The writer will continue to provide opportunities that make math real and fun for students by taking the students on field trips and on shopping sprees. Many of the students had never been to a museum or to a nature center.

It is very important to teach third-grade students

problem-solving strategies. The strategies are the key to students understanding word problems. Patterning and writing were the most useful tools. Patterning was very successful for all operations. Patterning was very motivational. There were many things that the children could do with patterns. After making the patterns the children would write about the patterns. Writing was the tool that unified the strategies for the students. Writing enabled the writer to integrate math throughout the curriculum.

The writer will continue to use cooperative groups. Cooperative groups are very helpful when there are a lot of low readers in the class. The students can help each other. A student does not feel threatened by not knowing in a small group. The writer will continue to give rewards to foster good behavior and keep the students focused on the math lessons.

The use of calculators was motivational to the students. The calculators were helpful when working with large numbers. Using the calculators allowed the students to concentrate on the process rather than on the calculations. The writer will continue to encourage parents to be math partners. The writer will continue to emphasis that in order for a student to solve word problems he/she must know how to read the words and understand what he/she is reading.

Recommendations

As a result of the practicum, the writer recommends:

1. That the teacher use a variety of strategies to teach

students how to increase problem-solving skills.

2. That the teacher have students work in cooperative groups.
3. That the teacher use writing as an integral part of the math program.
4. That math be integrated throughout the curriculum.

Dissemination

The writer has shared the information with the principal and staff at the writer's school. The writer plans to share the information with the District Staff Development Center. The writer will submit the report to a professional journal.

REFERENCES

Behounek, K. J., Rosenbaum, L. J., Brown, L., & Burcalow, J. V. (1988). Our class has twenty-five teachers. Arithmetic Teacher, 36(4), 13-17.

Bruni, J. V. (1982). Problem solving for the primary grades. Arithmetic Teacher, 29(6), 10-15.

Burns, M. (1985). The role of questioning. Arithmetic Teacher, 32(6), 14-16.

Campbell, P. F. (1984). Using a problem-solving approach in the primary grades. Arithmetic Teacher, 32(4), 11-14.

Charles, R. (1985). The role of problem solving. Arithmetic Teacher, 32(6), 48-50.

Fennell, F., & Ammon, R. (1985). Writing techniques for problem solvers. Arithmetic Teacher, 33(1), 24-25.

Huniker, D. M. (1989). Multiplication and division word problems: Improving students' understanding. Arithmetic Teacher, 37(2), 8-12.

Kantowski, M. G. (1981).. Problem solving. In E. Fennema, (Ed.), Mathematics Education Research: Implications for the 80's (pp. 111-125). Alexander, VA: Association for Supervision and Curriculum Development.

Knifong, J. D. & Burton, G. M. (1985). Understanding word problems. Arithmetic Teacher, 32(5), 13-14.

Kennedy, B. (1985, February). Writing letters to learn math. Learning, pp. 59-61.

O'Connell, S. R. (1992). Math pairs-parents as partners. Arithmetic Teacher, 40(1), 10-12..

Slavin, R. E., Leavey, M., & Madden, N. (1984). Combining cooperative learning and individualized instruction: Effects of student mathematics attitude and behaviors. Elementary School Journal, 84, 408-422.

Van de Walle, J., & Holbrook, H. (1987). Patterns, thinking, and problem solving. Arithmetic Teacher, 34(8), 6-12.

Van Haneghan, J. P. (1990). Third and fifth graders' use of multiple standards of evaluation to detect errors in word problems. Journal of Educational Psychology, 82(2), 352-358.

Wilde, S. (1991). Learning to write about mathematics. Arithmetic Teacher, 38(6), 38-42.

Wilson, K.J. (1991). Calculators and word problems in the primary grades. Arithmetic Teacher, 38(9), 12-14.

APPENDIX A

INTERVIEW QUESTIONS SEPTEMBER 1992

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The following questions were asked after the writer noticed that the students were having difficulty solving word problems.

1. I noticed that you were having difficulty getting started on solving the problems. What was the matter?
2. What is your reason for not liking story problems?
3. Let's take a look at some of the problems that we did and you can explain to me what you didn't like about them.
4. Let's read the problem together and then you tell me what you should do.
5. What did the story tell you?
6. What did the story ask you to find out?
7. What must you do in order to find the answer?
8. Would you like to do some fun activities this year that will help you learn to read and understand story problems so that they will be easy to solve?